THE COMMON CORE STATE STANDARDS FOR MATHEMATICS

Math Council Meetings
Fall 2010

Connecticut State Department of Education

Today's Agenda

- Review how CT adopted the CCSS
- Examine what SDE has done to support CCSS implementation
- React to what SDE has planned to continue to support CCSS implementation
- Begin to think about what is next for you

Understanding the Common Core State Standards

In the spring of 2009, governors and state commissioners of education from 48 states, 2 territories and the District of Columbia committed to developing a common core of state standards (CCSS) for K-12 English language arts (ELA) and mathematics.

http://www.corestandards.org/

Achieve, 2010

Math Standards Advances

- There is an emphasis on core conceptual understandings and procedures starting in the early grades.
- In grades K-5, students gain a solid foundation in whole numbers, addition, subtraction, multiplication, division, fractions, and decimals.
- In the middle grades, students build upon the strong foundation in grades K-5 through hands on learning in geometry, algebra, probability, and statistics.
- The high school standards focus on applying mathematical ways of thinking to real world issues and emphasize mathematical modeling.

Common Core Standards and Connecticut's Education Reform Agenda

The CCSS, adopted by the State Board on July 7, 2010,

- are internationally benchmarked
- prepare all students to succeed in a global economy
- support the State Board's 5-Year Plan
- support Connecticut's Secondary School Reform

The CCSS for Mathematics

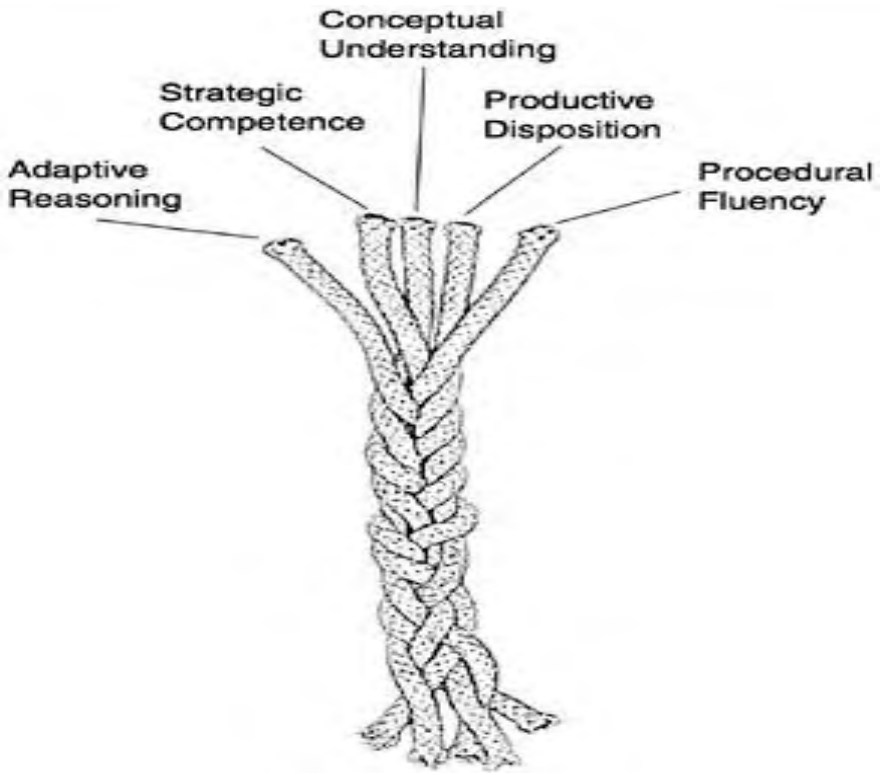
- Are comprised of K-12 Standards for Mathematical Practice that are based on the
  - NCTM Process Standards, and
  - NRC Strands of Mathematical Proficiency

NCTM | NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS

Process Standards

- Problem Solving
- Reasoning and Proof
- Communication
- Connections
- Representation

Intertwined Strands of Proficiency



- From *Adding It Up: Helping Children Learn Mathematics*, pages 115-117

CCSS K-12 Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

CCSS pages 6-8

The CCSS for Mathematics

- Are comprised of content that is organized
  - by Domains in grades K–8, and
  - by Conceptual Categories in grades 9–12

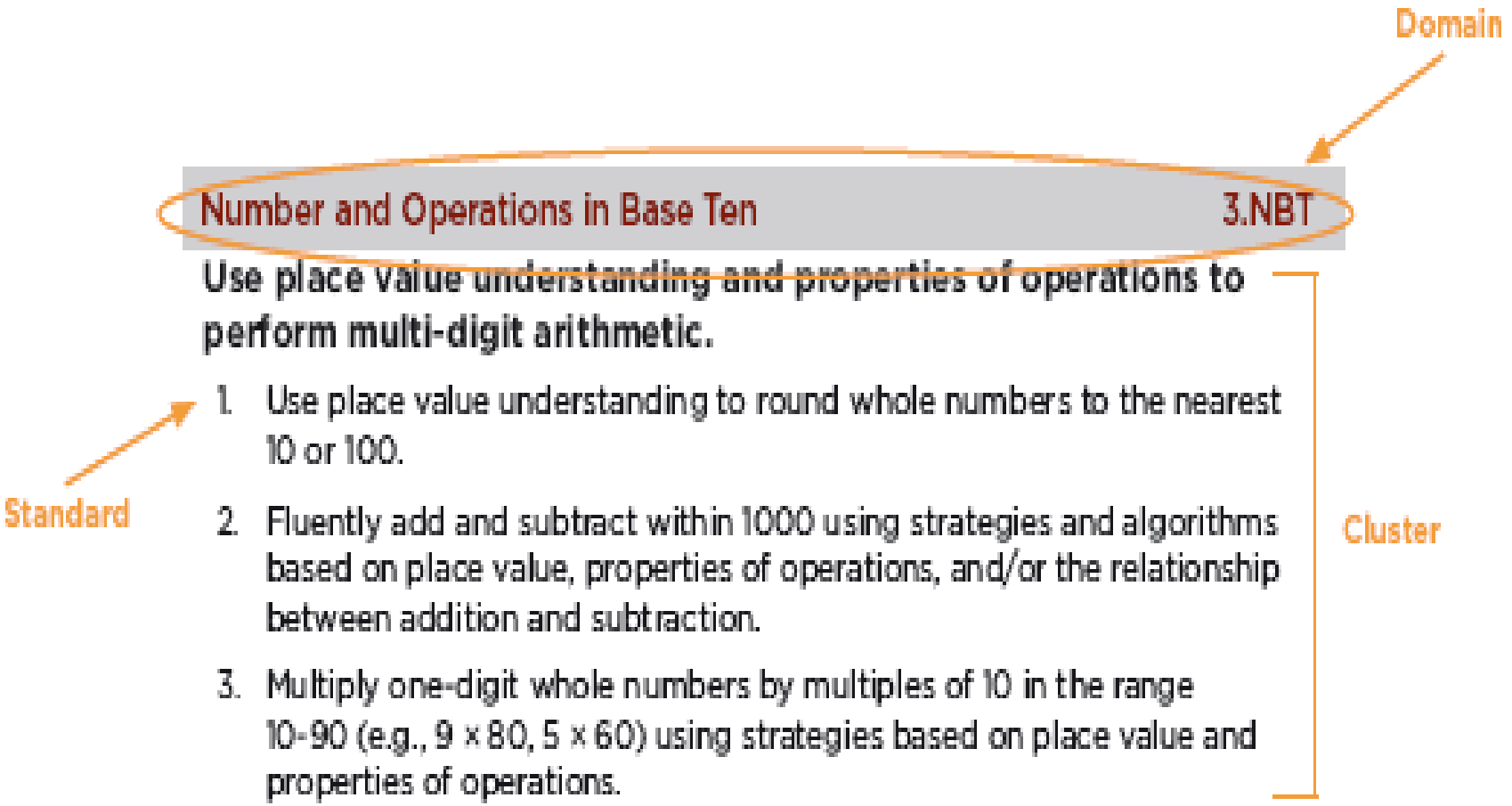
Common Core State Standards for Mathematics
K–8 Mathematics Content

DOMAINS	Counting & Cardinality	Operations & Algebraic Thinking	Number & Operations in Base Ten	Measurement & Data	Geometry	Number & Operations: Fractions	Ratios & Proportional Relationships	The Number System	Expressions & Equations	Statistics & Probability	Functions
K	X	X	X	X	X						
1		X	X	X	X						
2		X	X	X	X						
3		X	X	X	X	X					
4		X	X	X	X	X					
5		X	X	X	X	X					
6					X		X	X	X	X	
7					X		X	X	X	X	
8					X			X	X	X	X

CCSS for Mathematics
High School Conceptual Categories

- Number and Quantity
- Algebra
- Functions
- Modeling
- Geometry
- Statistics and Probability

How to Read the Standards



CCSS Components

- **Standards** define what students should understand and be able to do.
- **Clusters** summarize groups of related standards. Note that standards from different clusters may sometimes be closely related, because mathematics is a connected subject.
- **Domains** are larger groups of related standards. Standards from different domains may sometimes be closely related.

Standards Comparison Study

- Content experts in CT ELA and mathematics standards used the online interactive Common Core Comparison Tool developed by Achieve, Inc. to compare standards.

- Content experts worked in teams to determine the extent to which CCSS and CT standards are aligned.

Standards Comparison Study

- CCSS were compared to CT Standards, standard by standard at the same grade level.
- CCSS were also compared to CT Standards, at the prekindergarten level, grade levels before or after the targeted CCSS and by high school grade bands.
- The comparison process determined the level of match between the CCSS and the CT Standards.

Categories of Matches

- Possible matches:
  - Exact match
    - All of the concepts and skills addressed in the CCSS also included in the CT standard(s) at the same grade level
  - Collective match
    - Parts of two or more CT standards within, beyond or below grade, together address the CCSS
  - Partial match
    - Only a portion of a compound CT state standard applies to the CCSS being addressed and part does not; a CT standard in its entirety only addresses a portion of a compound CCSS
  - No match
    - The concepts and skills in the CCSS are not addressed in the CT standard(s), or is addressed at a level far beyond the parameters being compared

Strength of Match

- Strength rating accounts for differences in wording, specificity, or performance expectation
- Strength of each match is rated:
  - 3 – Excellent: the expectations in both verb/ performance and content/topic are equivalent
  - 2 – Good: minor aspects of the CCSS are missing (or addressed more broadly/generally than the CCSS)
  - 1 – Weak: major aspects of the CCSS are not addressed; standards may be related but only generally

Strength of Matches Between the CCSS and CT Mathematics Standards

- 68% of the matches were rated excellent or good;
- 24% of the matches to CT's math standards were rated weak. These are standards that need a close side-by-side comparison to fully understand the differences and their implications.

CCSS-Mathematics

CC.4.NF.2 Extend understanding of fraction equivalence and ordering: Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

- P. 30 of the CCSS Mathematics (CCSS)

CCSS Match to CT Mathematics

Match rate – 3; as linked to the following standards in grades 3, 4 and 5

Excellent match – expectations in both performance and content are equivalent

- CT.**3**.1.3.5 Demonstrate understanding of equivalence as a balanced relationship of quantities by using the equals sign to relate two quantities that are equivalent and the inequality symbols, < and >, to relate two quantities that are not equivalent. (23 x 5 > 23 x 2)
- CT.**4**.2.1.8 Construct and use models, pictures and number lines, including rulers to compare and order fractional parts of a whole and mixed numbers with like and unlike denominators of 2, 3, 4, 5, 6 and 8 and 10.
- CT.**4**.2.1.9 Construct and use models, pictures and number lines, including rulers, to identify wholes and parts of a whole (including a part of a group or groups) as simple fractions and mixed numbers.
- CT.**5**.2.1.7 Choose and use benchmarks to approximate locations, of fractions, mixed numbers and decimals, on number lines and coordinate grids.

Elementary Weak Match Example

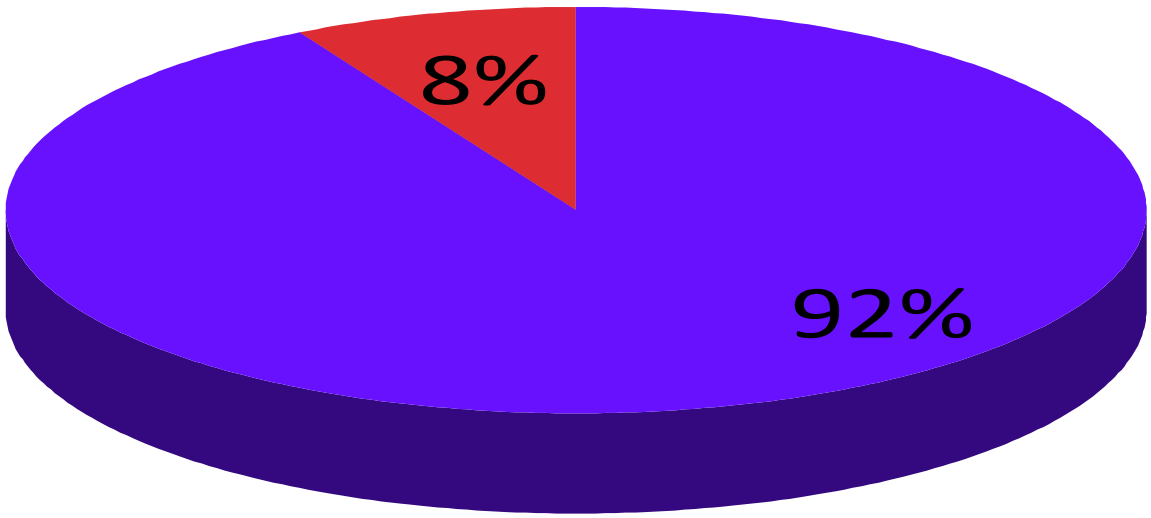
- CC.2.MD.1 Measure and estimate lengths in standard units. Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.
- CT.2.3.3.7 Use measurement tools such as thermometers to measure temperature, basic rulers to measure length to the nearest half-inch or centimeter, and balance scales to measure weight /mass in grams.

High School Weak Match Example

- CC.9-12.G.C.1 Understand and apply theorems about circles. Prove that all circles are similar.

- CT.9-12.3.C.2.a.(3) Apply transformations to plane figures to determine congruence, similarity, symmetry and tessellations.

Overall CCSS– CT Match Results

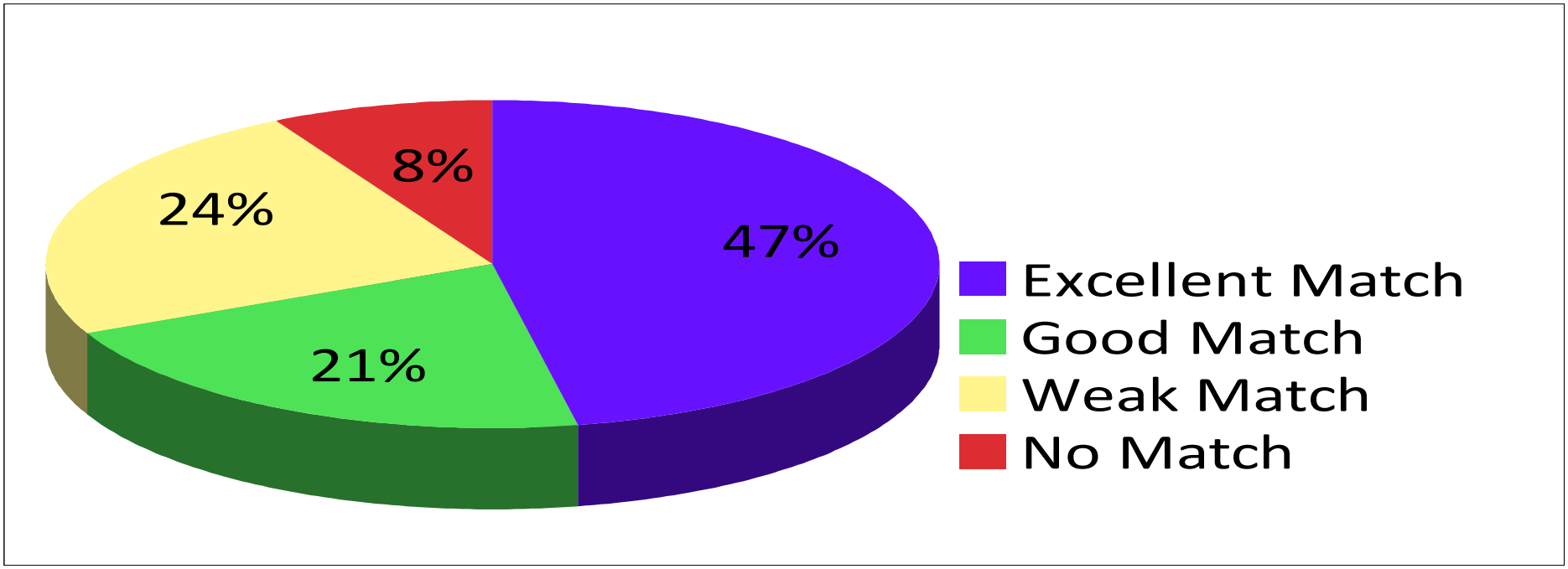


Matched to CT Standards

Not Matched CT Standards

Overall, 92% of the CC Math standards were matched to CT's Math standards. The remaining 8% were not matched. This translates to 40 CC Math standards that will be "new" for CT.

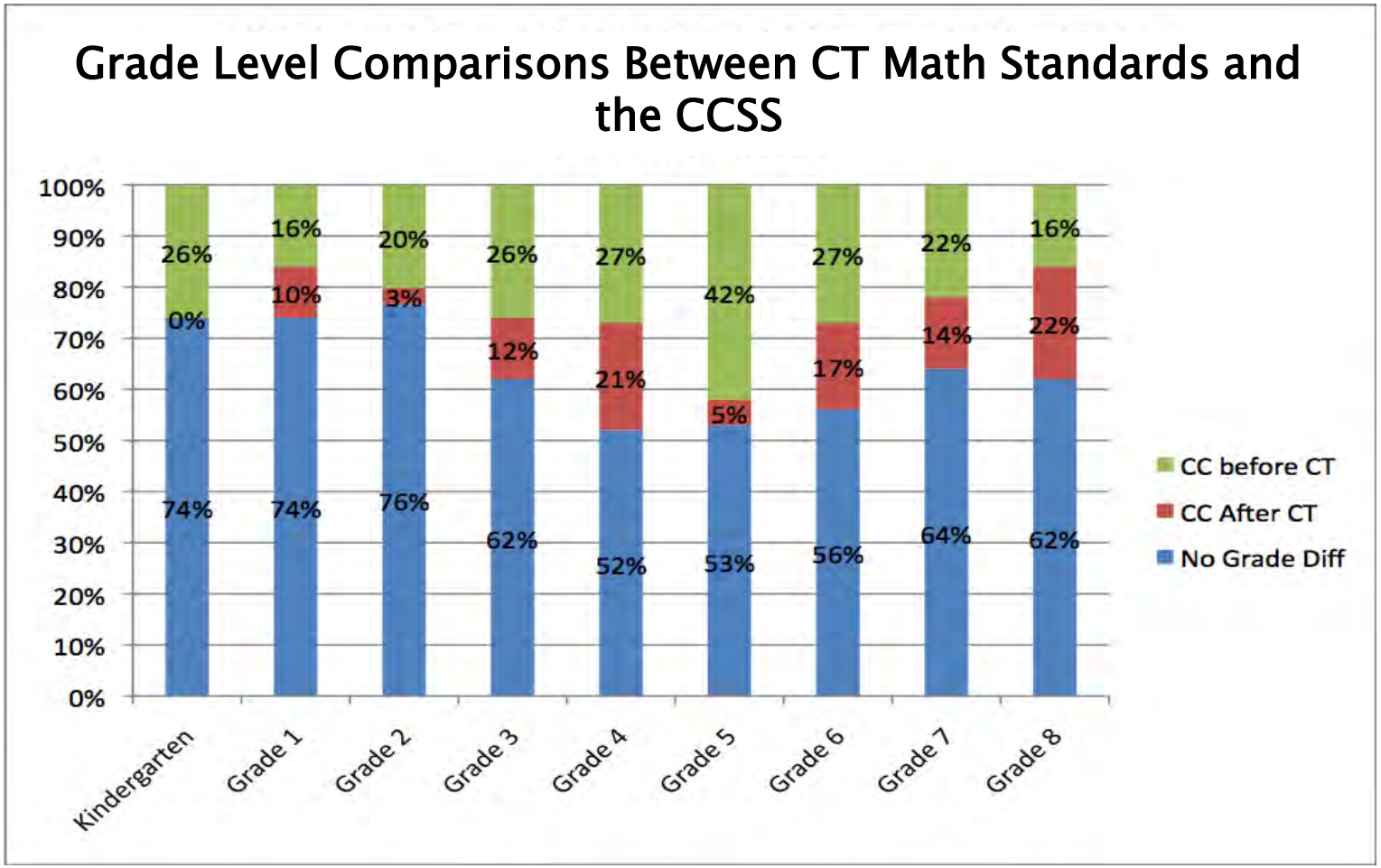
Strength of Matches Between the Common Core Math Standards and CT's Math Standards



Overall, 68% of the matches between the CCSS and CT Math standards were excellent or good; 24% were weak; and 8% were unmatched.

Grade Level Comparisons

- The following graph shows where matched Common Core standards in math introduce content earlier, later or at the same grade level as CT standards.
- Although there is a 92% match between CCSS and CT standards, the CCSS tend to introduce some math content at earlier grades.
- These grade differences will have implications for the following:
  - realigning curriculum;
  - evaluating instructional materials;
  - identifying professional development needs; and
  - developing assessments.



It is important to note that Grades 9-12 are not included on the graph because the Mathematics Standards for High School are written for the entire 9-12 grade span rather than for each grade level.

Example of Grade Level Difference: CCSS Before CT

- CC.6.EE.3 Apply and extend previous understandings of arithmetic to algebraic expressions. Apply the properties of operations to generate equivalent expressions. For example, apply the distributive property to the expression 3(2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y.
- CT.7.1.3.7 Evaluate and simplify algebraic expressions, equations and formulas using algebraic properties (i.e., commutative, associative, distributive, inverse operations, and the additive and multiplicative identities) and the order of operations.

Example of Grade Level Difference: CCSS After CT

- CC.6.NS.5 Apply and extend previous understandings of numbers to the system of rational numbers. Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, debits/credits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
- CT.5.2.1.4 Investigate negative integers (values less than zero) using place value models, diagrams and number lines and represent negative integers in practical applications, e.g. temperatures, money and locations below sea level.

Stakeholder Conference

- Representatives from education related organizations, districts, RESCs, colleges and universities, parent, community, social advocacy and community-based organizations attended the Stakeholder Engagement Conference on June 17, 2010 showed strong support for the Common Core standards.
- The following slides highlight the responses of 90 individuals to a series of survey prompts during the stakeholders conference.

Stakeholder Conference

Percentage of individuals who "Agree" or Strongly Agree

- Students meeting these core standards will be well prepared for success in college – 100%
- The CCSS are as rigorous as CT standards in terms of higher order thinking skills – 97%
- The CCSS represent a coherent progression of learning from grade-to-grade – 95%
- The CCSS are as rigorous as CT standards in terms of application of knowledge – 91%

Stakeholder Conference

Percentage of individuals who "Agree" or Strongly Agree

- The CCSS represent learning standards that are important for all students – 90%
- Students meeting these core standards will be well prepared for post-high school success in the workplace – 89%
- The CCSS embed 21st Century skills (i.e. communicating, collaborating, using technologies and solving problems creatively) – 87%
- The CCSS are developmentally appropriate for each grade – 82%

Consensus Judgments Regarding "New" Standards for CT

1. The CCSS that would be new for Connecticut are *essential for college and career readiness*.

   ELA: 100% agree

   MATH: 100% agree

2. The CCSS that would be new for Connecticut are *reasonable expectations for the corresponding grade level*.

   ELA: 78% agree; 22% not sure

   MATH: 60% agree; 40% not sure

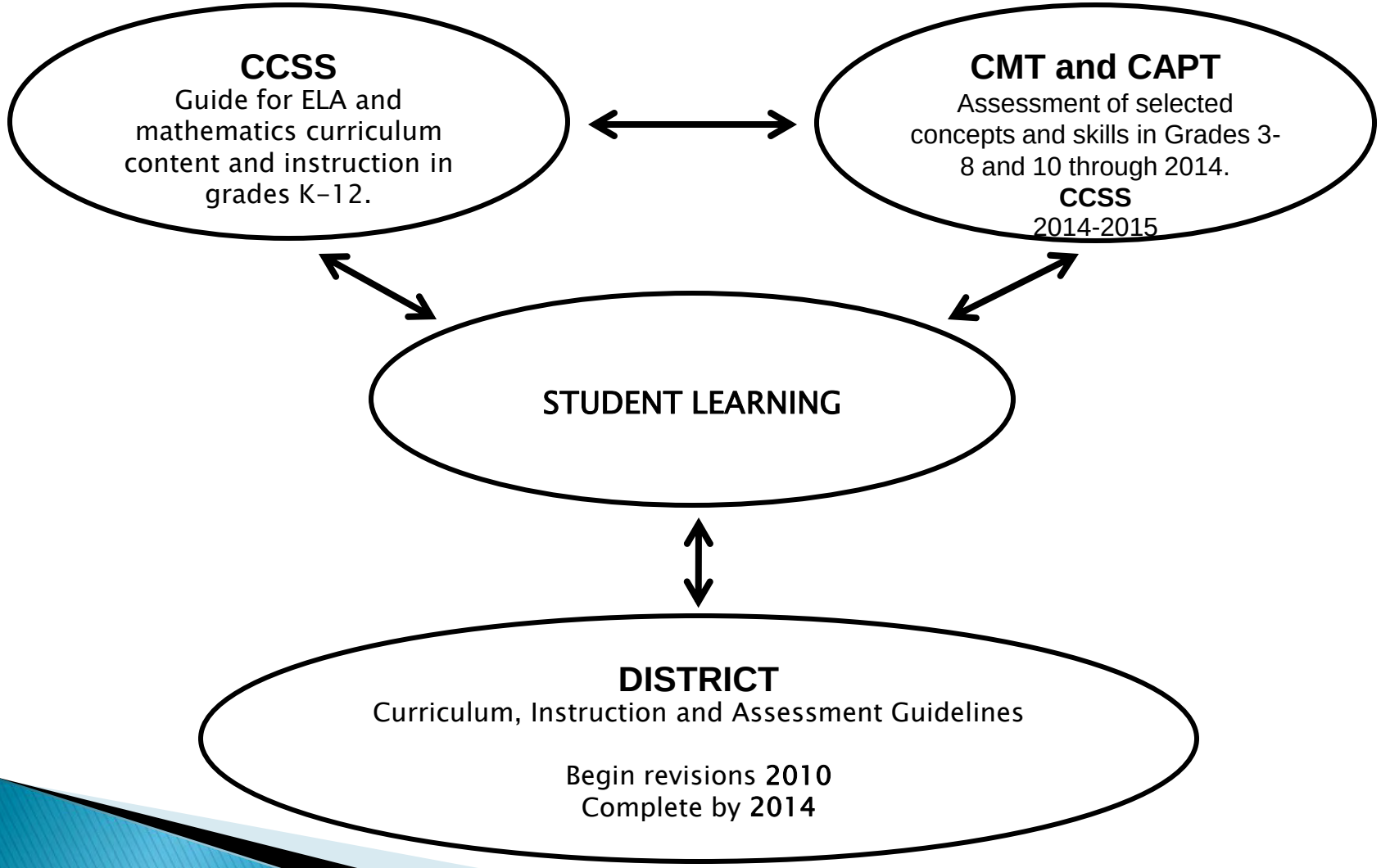
Stakeholder Needs

- Preschool standards aligned with CCSS
- Support with aligning district curriculum to CCSS
- Higher Ed awareness for teacher preparation and post secondary instruction
- Standards phase-in timeline
- Adequate notice of changes to state assessments

Important Considerations

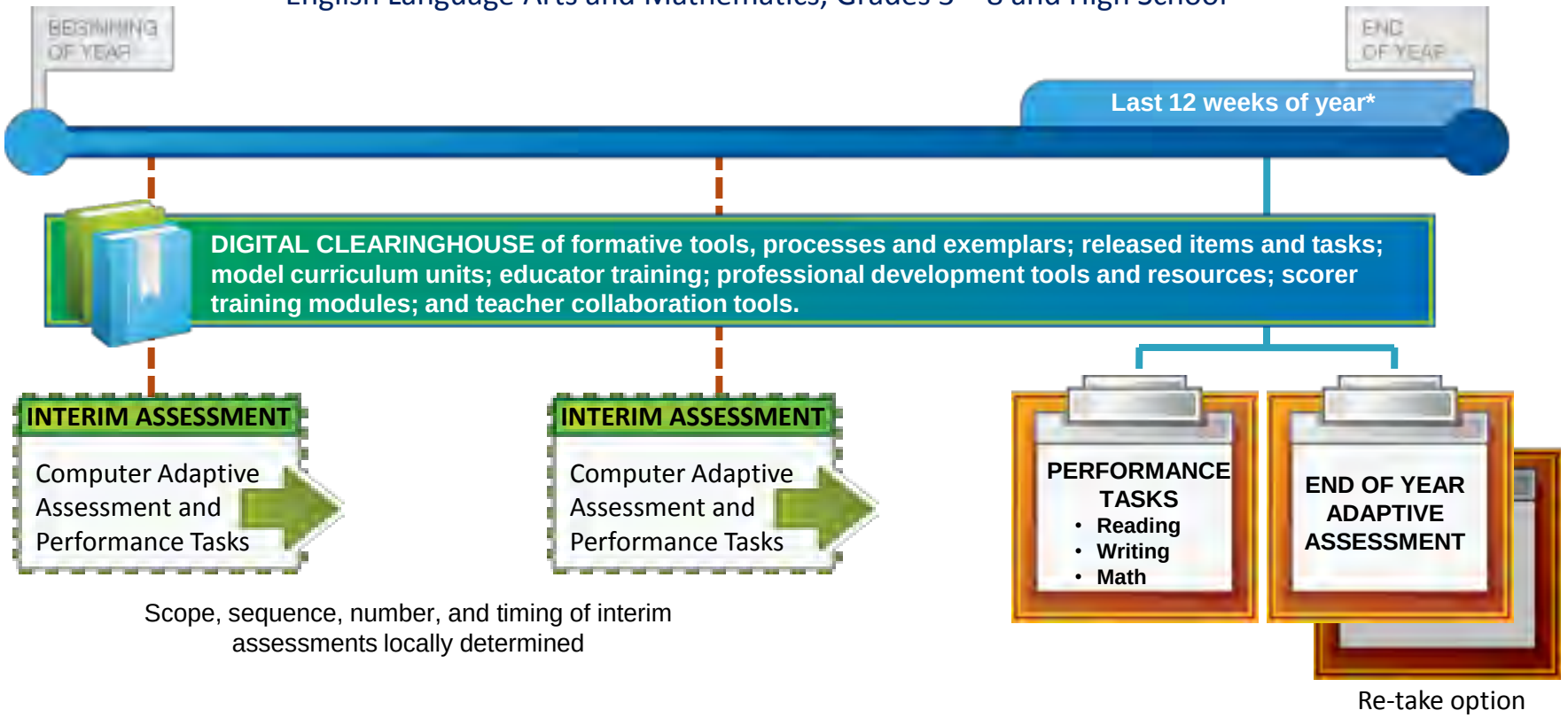
- Districts will need to compare current math curriculum to CCSS. Much will stay the same, however some CCSS concepts/skills may need to be added; some current standards move to a different grade.
- Current instructional materials may need to be supplemented, enhanced or moved to a different grade.
- Practicing and pre-service teachers need to be provided support to understand the impact of the CCSS on designing learning opportunities for students.
- State assessments will remain unchanged until 2014. CT is participating in the Smarter Balanced Assessment Consortium charged with developing new assessments based on the CCSS by 2015.

Using the CCSS in Your District…



The SBAC System

English Language Arts and Mathematics, Grades 3 – 8 and High School



* Time windows may be adjusted based on results from the research agenda and final implementation decisions.

Benefits

- Fewer, clearer, next-generation standards
- Systems of high quality, aligned summative and formative assessments, with rapid results to teachers
- Online digital libraries for sharing of resources, identification of effective practices, etc.
- Leveraging of human and financial capital across states

Challenges

- **Measurement challenges:**
  - Measuring individual growth and "on track"
  - Use of individual student growth in determinations of teacher and principal effectiveness
  - Equating and reliability of through-course assessments
- **Curricular Flexibility at the Local level:**
  - Tension: Modular assessments given across the year require greater uniformity in sequencing of instruction, but place assessment closer to the time of instruction.
- **ESEA Reauthorization**:
  - Will it align?
- **Political Will:**
  - Will states that didn't win State RTTT grants remain in Consortia? Will new Governors?
- **Information System:**
  - Will it be possible to mine the data to identify "what works" and "what has worked" for similar students?

The New Common Core State Standards Assessment Systems

Center for K-12 Assessment and Performance Management at ETS

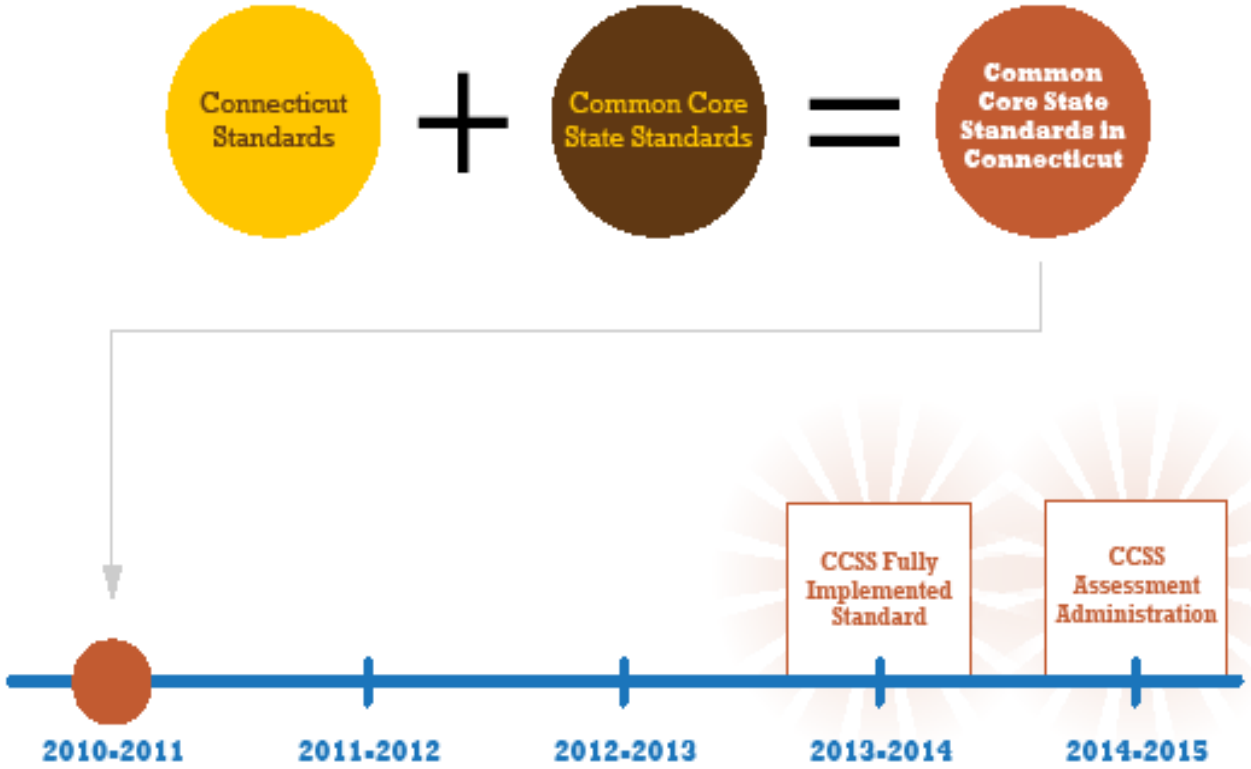
Educational Testing Service

www.k12center.org

Check the Center's website in January for a new 12-page guide to the coming assessment systems.

COMMON CORE STATE STANDARDS IN CONNECTICUT

IMPLEMENTATION GUIDE



CSDE Support

Unmatched CT standards and crosswalk update meeting 30 November 2010

- http://www.ct.gov/sde/ccss

CSDE Support

Your State Department of Education is working with the following organizations to create documents and identify resources that support CCSS implementation:

- Rigorous Curriculum Design
- CCSSO Mathematics SCASS
- ASSM
- NCSM
- NCTM
- AMTE

CROSSWALK PDF. -example

MEASUREMENT AND DATA			
Represent and interpret data.			
CCSS	**CT Standard Match**	**CT Assessment**	**Notes**
CC.5.MD.5a Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent three-fold whole-number products as volumes, e.g., to represent the associative property of multiplication.	CT.5.3.3.9 Use cubic inch or cubic centimeter models to find the volume of rectangular solids. CT.6.3.2.6 Use and describe concrete strategies for finding the volume of rectangular solids and cylinders. CT.7.3.3.9 Develop and use formulas to determine volumes of geometric solids (rectangular prisms and cylinders).	Grade 6, 7, 8: 16A. Measure and determine perimeters, areas and volumes. Explain or show how the solution was determined.	The Grade 5 Common Core standard progresses toward the development of a formula within Grade 5 while the CT standards move from concrete to abstract across Grades 5, 6 and 7. Volume not assessed until CMT Grade 6 and beyond.
CC.5.MD.5b Apply the formulas V =(l)(w)(h) and V = (b)(h) for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real-world and mathematical problems.	CT.6.3.3.8 Select and use appropriate strategies, tools and units to estimate and solve measurement problems involving length, perimeter, area, volume, capacity, mass and weight. CT.7.3.3.9 Develop and use formulas to determine volumes of geometric solids (rectangular prisms and cylinders).	Grade 6, 7, 8: 16A. Measure and determine perimeters, areas and volumes. Explain or show how the solution was determined.	The development and application of volume formulas occurs more gradually in CT standards but is concentrated in Grade 5 in CC. Volume not assessed until CMT Grade 6 and beyond.
CC.5.MD.5c Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.	CT.7.3.3.9 Develop and use formulas to determine volumes of geometric solids (rectangular prisms and cylinders). CT.8.3.3.9 Use estimation and measurement strategies, including formulas, to solve surface area and volume problems in context.	Grade 6, 7, 8: 16A. Measure and determine perimeters, areas and volumes. Explain or show how the solution was determined.	CT standards do not specify the additive nature of volume with respect to combining non-overlapping prisms. Volume not assessed until CMT Grade 6 and beyond.

Crosswalk Word Document for use in District CCSS Correlation

MEASUREMENT AND DATA			
Represent and interpret data.			
CCSS	**CT Standard Match**	**District Correlation**	**CT Assessment**
CC.5.MD.2 Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally	**CT.5.4.1.1** Represent sets of data using line plots, bar graphs, double bar graphs, pictographs, simple circle graphs, stem and leaf plots and scatter plots.		Line plots are not assessed on the CMT.
Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.			
CCSS	**CT Standard Match**	**District Correlation**	**CT Assessment**
CC.5.MD.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement. a. A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume. b. A solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units.	**CT.5.3.3.9** Use cubic inch or cubic centimeter models to find the volume of rectangular solids.		The use of unit cubes to determine volume requires a performance task and is not assessed on the CMT. Algorithmic determination and estimation of volume is assessed on the Grades 6, 7 and 8 CMT.

Next Steps for Districts

- Use the Crosswalks!
  - Become familiar w/content
  - Make decisions about test correlation
  - Examine district curriculum
- Work on intentional inclusion of the CCSS Standards for Mathematical Practice at **every** grade **level.**
- Watch the website for updates

QUESTIONS

Contact Information

Charlene Tate Nichols
Bureau of Teaching and Learning
(860) 713-6757
charlene.tate.nichols@ct.gov